RESPONSE

The present invention is directed to a method of ALD deposition wherein the precursor gases flow into the reactor chamber from an auxiliary chamber solely due to a pressure gradient between the two chambers. This method reduces the use of excess precursor gas and ensures the spatial uniformity of layers produced by the ALD process.

As noted in the specification of the instant application, the present invention overcomes several disadvantages of prior art ALD processes that rely on gas being delivered through a flow line to the deposition chamber. In particular, pressure naturally varies over a flow line such that when the precursor gas is delivered through a flow line, uniform deposition is not possible. Further, prior art ALD processes utilize flow controllers to control the flow rate through the flow lines, such flow controllers having relatively slow reaction times, that results in flow rates being set at a constant rate and leading to significant waste of gas.

The present invention overcomes all of these disadvantages by providing a method of delivering precursor gases that specifically allows each precursor gas to flow from an auxiliary chamber to the reactor chamber solely under a gradient pressure.

The Examiner has repeated the rejection of claims 11-17 under 35 USC 102(e) as being anticipated by Sneh, wherein the Examiner indicates that Sneh discloses a method of delivering precursor gases for an ALD process that utilizes separate booster chambers for each chemical reactant, and valves for admitting the reactants to a reaction chamber. The Examiner states that the process of Sneh "is run solely under a pressure gradient" citing paragraphs 38 and 89. The Examiner also points to other sections of Sneh as teaching various aspects of the dependent claims of the present invention.

Further, in response to previous arguments submitted by the applicant, the Examiner has provided an esoteric discussion of what he believes "gradient pressure" to mean, including references to electrophoresis and temperature driven flows. However, this discussion does not alter the basic fact that Sneh clearly fails to teach or suggest the present invention as will be discussed in more detail below.

The rejections of the Examiner are respectfully traversed and it is respectfully submitted that the present invention is patentably distinct from Sneh. Contrary to the Examiner's allegations, Sneh does not teach or suggest an ALD method wherein precursor gas flows from auxiliary chambers to an inlet of the process chamber solely under a pressure gradient as required by the present invention, (see claim 11). Rather, Sneh requires a relatively complex "Synchronous Modulation of Flow and Draw (SMFD)" process to achieve 1) short reaction times with good chemical utilization, and 2) minimum purge gas and chemical removal times while preventing backflow (See Sneh paragraph 22). In fact, the Sneh paragraphs cited by the Examiner as supporting pressure gradient flow, actually teach away from such a process. Paragraph 38 of Sneh clearly states in part that the first chemical reactant is provided to the deposition chamber by "flowing a first chemical reactant gas at a selected first-dosage flow rate and at an independently selected first-dosage pressure" comprising "controlling the first-dosage flow rate of the first chemical reactant gas into the deposition chamber and independently substantially matching a first-chemical draw of the first chemical reactant gas out of the deposition chamber". Further, paragraph 89 of Sneh states in part that the flow of "chemically reactive gas into deposition chamber 114 conforms to an initial pulse that gradually decreases to the steady-state flow" with a concurrent draw pressure being applied to the process chamber.

The use of the term pressure gradient in the present invention is clearly used in the normal and understood manner, meaning a movement caused by a differential in pressure between two different areas. In other words, the pressure gradient flow of the present invention is caused solely by the difference in pressure between the reactor chamber and the auxiliary chambers without any other force acting thereon.

It is abundantly clear that the flow discussed in Sneh is not due solely to a pressure gradient. Rather, Sneh employs a number of elements to create a desired flow of gas in and out of the process chamber, including a booster chambers, a gas distribution chamber, a draw control chamber, a pump and numerous flow restrictors and valves. Nothing in Sneh teaches the specific method of the present invention set forth in claims 11-17 requiring opening and closing of specific valves and allowing the precursor gas to flow solely under a pressure gradient.

Therefore, it is respectfully submitted that claims 11-17 of the present invention are patentably distinct from Sneh and it is respectfully requested that the rejection of such claims under 35 USC 102(e) be withdrawn.

The Examiner has also repeated the rejection of claims 18-19 under 35 USC 103(a) as being unpatentable over Satta et al in view of Sneh, and of claim 20 under 35 USC 103(a) as being unpatentable over Sneh in view of Kang. These rejections are respectfully traversed and it is respectfully submitted that the present claims are patentably distinct from the references cited.

In each of the above rejections the Examiner relies on Sneh for the teachings as set forth in the rejection of claims 1-17. In this light, it has already been shown that Sneh fails to teach or suggest the present invention. Further, the Examiner

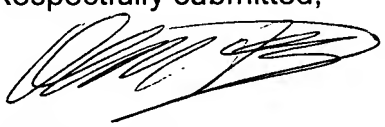
does not suggest, that either Satta et al or Kang overcome the deficiencies of Sneh.

Therefore, it is respectfully submitted that claims 18-19 of the present invention are patentably distinct from Satta et al in view of Sneh and it is respectfully requested that the rejection of such claims under 35 USC 103(a) be withdrawn.

Further, it is respectfully submitted that claim 20 of the present invention is patentably distinct from Sneh in view of Kang and it is respectfully requested that the rejection of such claim under 35 USC 103(a) be withdrawn.

It is respectfully submitted that the present application is now in condition for allowance and further action consistent therewith is respectfully requested.

Respectfully submitted,



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